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Science and Man . . . By Joshua Lederberg

The Disease of Malnutrition

MALNUTRITION is the most prevalent disease of the human species. It is primarily associated with poverty and ignorance. Many populations somehow subsist on marginal diets barely sufficient in total calories to sustain life — and fail to acquire enough of the special nutrients needed for normal body development and resistance to disease.

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The result, in vast areas of the world, is a heavy toll of infant mortality, stunting of growth, easy vulnerability to otherwise nonlethal diseases like malaria and measles, and, in all likelihood, irreversible setbacks in the development of the brain and its intellectual functions.

Reliable statistics on malnutrition are nonexistent. It is a reasonable guess that a third of the world's population is suffering a substantial penalty that could be alleviated by improved foods. Reduction in vigor and capacity to produce is of course a crucial element in the vicious cycle of nonproductivity, poverty, disease and undereducation.

Malnutrition has been regarded as mainly an economic problem, but we do not begin to use and develop the scientific information that could alleviate malnutrition even within pressing limitations of cost.

FOR EXAMPLE, a Senate committee has recently rediscovered malnutrition in the United States, in pockets of poverty in Mississippi and Appalachia. The evidence is compelling, but it is nonspecific. We see pictures of unhealthy children, but we do not know exactly what deficiency they are suffering.

The families live on welfare payments that constitute miserable standards of living by United States norms, yet greatly exceed the budgets for nutrition even dreamed of by planners for the underdeveloped world. In an economic framework not geared to efficient provision for the poor, these families simply do not know how to stretch their food dollars: malnutrition on a diet that includes canned meats is a paragon of economic absurdity. The grocery shelves do not stock the foods most appropriate to this economic level.

If we knew the specific nutritional deficits of these children, they could be made up with synthetic nutrients for a few dollars a year.

For many years, vitamins were the main targets of nutritional supplementation. Diseases like beri-beri, scurvy, rickets and pellagra, were global scourges, but they could be prevented by public education about balanced diets and by inexpensive enrichment of flour and other staples. And vitamins are too readily available in a wide variety of foods in the very small quantities needed for human nutrition, to represent a serious economic problem.

However, vitamin deficiencies, and diseases from insufficient iron, calcium or iodine, are still too prevalent to be dismissed as public health problems. Although American science has made an enormous contribution to world health through the biochemical research that led to our present knowledge of these factors, there remains a great deal more that we can do through technical assistance to countries that are still struggling to understand and solve these nutritional problems.

Patience and understanding of local traditions are often more helpful than profound scientific expertise in communicating the essentials of good nutrition to other people. Much of the success of the Peace Corps is founded on this principle.

BUT THE MAIN challenge to world nutrition are the essential amino acids, the so-called animal protein problem. Any number of technical solutions deserve a detailed discussion, and many are being implemented. Nevertheless we still have only the vaguest idea of the quantitative magnitude of the problem.

We do know that the human biochemical machinery can fabricate only 9 or 10 of the 20 amino acids. The others must be furnished in the diet. A deficiency of any one prevents the cells from making the full range of proteins needed for growth and life. Four of these amino acids, lysine, threonine, tryptophan and methionine, are especially critical since they are likely to be under-represented in the proteins of many food crops.

Food animals, fowl and fish produce more balanced proteins—they concentrate these essential molecules from their own plant diets, or, in the case of the ruminant cattle, maintain a built-in fermentation plant for microbial production.

Hence, it is the meat-poor diets of countries with subsistence agricultures that suffer from amino acid deficiencies. We are, however, making wild guesses when we try to assess just how much of which amino acids must be included in various diets.

A crucial difficulty is that the nutritional standards established for middle class Americans may be totally irrelevant to the underdeveloped world. Differences in the residual diet, climate, work demands and racial composition may all play an important part. The scientific analysis of nutritional needs should be recognized as an essential part of our long range plans on how the world can feed itself.